

APPENDIX F

SIDE SCAN SURVEY



ATLANTIC RICHFIELD COMPANY (ARCO)

REVISED PRC-421 PIER REMOVAL PROJECT

This section provides information on the results of a bathymetric and side scan sonar survey of the seabed areas in the immediate vicinity of the Pier PRC-421 structure as performed by Fugro West, Inc. of Ventura, CA.

FUGRO WEST, INC.



**BATHYMETRY AND SEAFLOOR FEATURES SURVEY
STATE LEASE PRC-421
SANTA BARBARA COUNTY, CALIFORNIA**

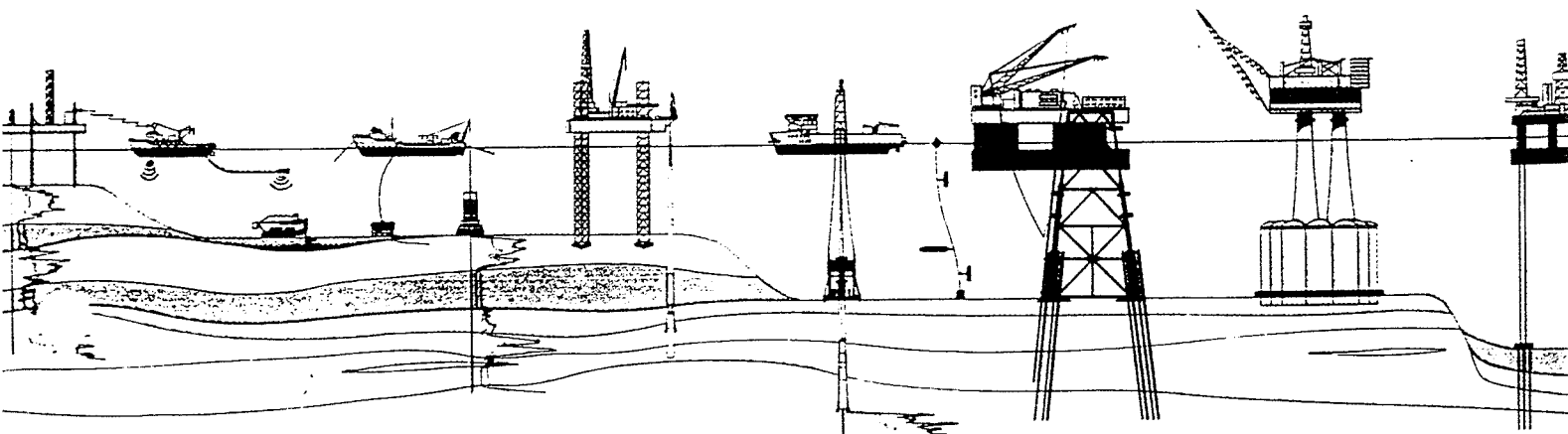
MARCH 1999

Report prepared

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STATE LEASE PRC-421
SANTA BARBARA COUNTY, CALIFORNIA
March 1999**

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APPENDICES

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- Appendix B** Survey and Geodetic Parameters
- Appendix C** Survey Personnel
- Appendix D** Survey Map



1.0 INTRODUCTION

On March 10, 1999, Fugro West, Inc. (Fugro) under contract to Oceaneering International conducted a high precision Multibeam Bathymetry and Side Scan Sonar Survey of California State Lease Block PRC-421. This project was conducted as part the of the Arco lease abandonment procedures for Fairweather E & P Services, Inc.

In order to determine the aerial extent of hardbottom areas as well as location of debris, a full coverage side scan sonar survey was conducted in March 1999. The results of the side scan survey have been used to prepare a *Bathymetry and Seafloor Features Map* of the Lease. The side scan survey as well as the results of the survey and survey map are provided in this report.

We note that the side scan records show information relative to rock and debris that protrudes up above the existing seafloor. Debris or rock that is buried by seafloor sediments or a mobile sand layer is not visible on the side scan records.

2.0 SURVEY OPERATIONS OVERVIEW

Vessel. The R/V *Julie Ann* was used as the survey platform for the side scan sonar survey. The *Julie Ann* is a dedicated purpose built 26-foot Hydrographic and Geophysical Survey Vessel that is owned and operated by Fugro West.

Date of Survey. The R/V *Julie Ann* was mobilized with the navigation, sonar, and bathymetry systems at Fugro's Ventura facility on March 1, 1999. The vessel and crew departed Santa Barbara Harbor for the project site early on the morning of March 10, 1999, with survey operations commencing upon arrival at PRC-421. The survey was completed later that day after which the vessel and crew returned to Santa Barbara Harbor. Field survey operations were conducted in fair weather.

Survey Scope. Sonar and bathymetric data for the survey were collected along 23 survey tracklines oriented perpendicular to shore. The survey tracklines were

planned to provide a theoretical minimum 200 percent coverage of the seafloor in the survey area and were oriented to provide optimum coverage of the area. Sonar imagery and bathymetric data were acquired concurrently during the survey. Vessel speed averaged approximately four knots during the survey.

3.0 SURVEY INSTRUMENTATION

All survey and positioning equipment was mobilized onboard the Julie Ann at Fugro's offices in Ventura. The vessel was mobilized to Santa Barbara completed mobilized. Onsite multi-beam calibration procedures were followed to optimize data quality. The following sections contain a detailed narrative related to survey instrumentation.

3.1 *Navigation and Positioning System*

Wide area DGPS was used to position the survey vessel. GPS is a satellite-based positioning system operated by the U.S. Department of Defense. A "wide area" application operates with correction values applied to a stand alone GPS receiver from base stations located over large distances. DGPS corrections were supplied to the system using the STARFIX II network. This differential network is a nationwide system operated by the Fugro subsidiary John E. Chance and Associates. STARFIX II broadcasts differential corrections via a communications satellite downlink to field receivers.

The vessel position information is linked to an onboard Pentium-based personal computer running Hypack navigational software. Hypack is an advanced PC-based Windows navigation system designed for both surface and sub-surface vehicle positioning. A helmsman's display continually updates the true vessel position, the track-lines, distances off line, and distances along line. Other common I/O interfaces include connections to gyros, echo sounders, side scan sonar, fluxgate compasses, acoustic tracking systems, or virtually any receiver/sensor capable of a standard serial interface.

For this survey, the Hypack navigation system was interfaced to the onboard POS/MV Integrated DGPS / Inertial Reference System. The system uses two embedded Novatel 12 Channel GPS receivers with final position generated from the inertial unit. The update rate is one-second and the system has a horizontal accuracy of 1.5-meter (RMS) with DGPS corrections. The systems GPS engines receive ranging information from the same satellites as the reference stations. The STARFIX II system also receives the range corrections from the onshore reference stations. These corrections are applied to the DGPS receiver's satellite data to produce a corrected accurate position of the vessel in real-time that drives the inertial unit. This inertial position is then passed to the multi-beam data collection system, the side scan sonar system, and the navigation computer.

3.2 *GPS Inertial Motion Reference System*

The TSS POS/MV 320 GPS/Inertial Motion Reference System delivers full 6 degree-of-freedom position and orientation solutions for marine survey vessels. The POS/MV outputs all motion variables at high rate: Position, Velocity, Heave, Roll, Pitch, True Heading, Acceleration Vectors, Angular Rate Vectors. The system combines GPS/DGPS with rugged high-quality inertial sensors. The system measures true heading together with roll and pitch to 0.05 degree accuracy or better under dynamic conditions including hard turns and rapid acceleration or deceleration with heave accuracy of 5cm or 5% all in real-time.

3.3 *Multibeam Bathymetry and Sonar System*

The Reson Seabat 8101 transmits a fan beam with a vertical beam width of 1.5 degrees at 240 kHz. The 101 simultaneous receive beams have a vertical beam width of 15 degrees, and a horizontal beam width of 1.5 degrees. Convolution of the transmit and receive beam patterns, will result in 101 individual beams with a square beam width of 1.5 degrees providing total swath coverage of 7.4x water depth.

Bathymetry. The Seabat's 101 beams are sampled at intervals corresponding to 1.25cm range resolution, and the intensity data is displayed in full real time,